Satellite Remote Sensing and Ground-based Estimates of Forest Biomass and Canopy Structure

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This poster is about satellite remote sensor measurements of vegetation. Specifically, it discusses two vegetation indices: leaf area index (LAI) and normalized difference vegetation index (NDVI), and field studies underway to measure *in situ* forest properties for validation of orbital observations. Globally, forest biomes have vast distribution and pervasive impact on life and physical processes, including control of energy and mass exchange with the atmosphere. However, forests present major challenges to remote measurement from factors that include dynamic seasonal changes in leaf chemistry and biomass, non-uniformity of spectral response within and between species, canopy architectural influences, and sensor-related factors such as viewing geometry and atmospheric interference.

Many EPA research and regulatory themes require information on forest properties that can only be effectively derived from remote sensing:

- Biogenic emissions: LAI is a model input.
- Atmospheric deposition: forest location, species and biomass estimates help predict deposition of atmospheric species (e.g., terrorist biochemical releases, ammonia, nitrogen).
- Climate models: require forest LAI to compute Net Primary Production to calculate carbon sequestration potential.
- Water quality: studies require up to date land-cover maps for quantifying landscape inputs to ground and surface waters.
- Land-cover mapping: requires improved methods for remote mapping of forest species, associations and status.

This research has two goals: 1) to develop improved methods for land-cover mapping and landscape change detection using remote sensing; and 2) to validate LAI and NDVI estimates from the NASA sensor, MODIS (Moderate Resolution Imaging Spectroradiometer).We have established a network of index sites in the Albemarle-Pamlico Basin of North Carolina and Virginia where we employ an emerging methodology for *in situ* LAI measurement using optical instruments: hemispherical photography and sunfleck profiling. This collaboration involves researchers from EPA-RTP (NERL, NCEA), NASA, academia (Duke University, North Carolina State University), state government (Virginia and North Carolina) and private industry (Westvaco Corporation, International Paper Corporation). In this poster we describe the satellite data, *in situ* measurements of forest LAI, and database of related field measurements.

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